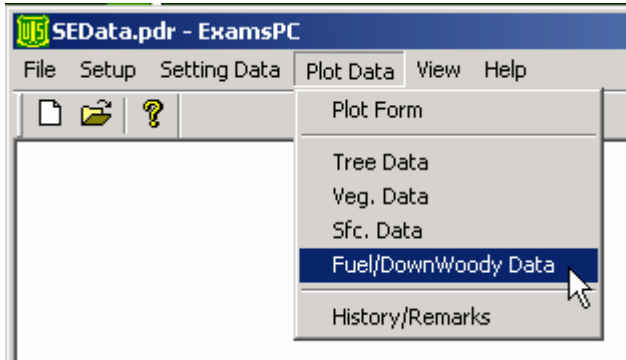


Down Woody Material

Downed woody material is the dead twigs, branches, stems, boles of trees, and brush that have fallen and lie on or above the ground. This data is used to provide quantitative estimates of downed woody material and duff. The accuracy standard is "No Errors" unless otherwise noted.

Portable Data Recorders:

From the main menu, enter “**Plot Data,**” then “**Fuel/Down Woody Data.**”



Only the settings that specified that down woody material data will be collected, on the exam level, will show up for selection. Select the setting ID and plot number for the surface cover data. Finally, select the “**Next**” button at the bottom of the screen.

Click on Setting						Click on Plot	
Reg	PF	RD	Location	Stand	Plot ID		
09	03	02	154	0002	Plot #1		

Fuel/Downwoody Data; Setting: 0903021540002 Plot: 0001										
	Duf1	Duf2	FuD	Twg1	Twg2	Twg3	Dec	Cnt	Diam	Len
	2.00	2.2	3.5	23	8	5				
							1	1	4.3	3.4
							3	1	10.7	7.8
▶							3	1	8.6	9.7

To insert a new line of data, use the down arrow. Notice that only one line of information is available for the duff and twig measurements, but many lines are available for the large size pieces.

The buttons along the bottom of the screen have the following function:

Help	Explanations of valid codes for each field.
Back	Return to the previous screen to select another setting ID or plot number.
Cancel	Delete all changes; restore all field selections to the original list that accompanied the software. A warning message is displayed.
Save	Save all changes and return to the main menu.

Finish	Finish and return to the main menu.
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Plot Number (3-digit) Required

Record the unique plot number where the information is being collected. This field is used only for paper forms.

First Duff and Second Duff (2,1-digit)

Do not measure duff depth in saturated lowland types such as bogs, sedge meadows and saturated brush types.

Record the duff depth in inches, to the nearest 0.1-inch. Duff is the fermentation and humus layers of the forest floor. It does not include the freshly cast material in the litter layer. The top of the duff is where needles, leaves and other castoff vegetative material have noticeably begun to decompose. Individual particles usually will be bound by fungal mycelium. When moss is present, the top of the duff is just below the green portion of the moss. The bottom of the duff layer is the start of the mineral soil.

Carefully expose a profile of the forest floor for the measurement. A knife or hatchet helps but is not essential. Avoid compacting or loosening the duff where the depth is measured.

Take the first duff measurement at one foot from the sample plot center and record it in the "First Duff" column. Take the second duff at six feet from sample plot center and record it in the "Second Duff" column. When stumps, logs, and trees occur at the plot of measurement, offset one foot perpendicular to the right of the sampling plane. Measure through rotten logs when the central axis is in the duff layer. Accuracy Standard: Plot average duff depth $\pm 1/2$ inch

Fuel Depth (2,1-digit)

Record the total vertical fuel depth to the nearest 0.1-foot. Take three measurements, along the transect at the 10 foot, 40 foot and 70 foot marks, and record the average depth. The fuel bed is the accumulation of dead, woody residue on the forest floor. It begins at the top of the duff layer and includes litter, dead branches and boles from trees, and dead material from shrubs, herbs, and grasses. Dead branches on trees, and dead stems and branches still attached to the ground (i.e. standing dead plants) are not included. Measure from the top of the duff layer to the highest dead particle above the point to the nearest tenth foot. On suspended logs, (e.g. spanning a ravine) enter the distance between the top of the duff layer to the top of the log. Accuracy Standard: $\pm 20\%$

Twig 1 (0 - .24) (3-digit)

Record the number of 1-hour fuels intersecting the first 7 feet of the Brown's transect. 1-hour fuels are defined as pieces that have a cross section diameter of less than 1/4 inch at the point of intersection with the sampling plane. Accuracy Standard: $\pm 40\%$

Twig 2 (.25 - .99) (3-digit)

Record the number of 10-hour fuels intersecting the first 7 feet of the Brown's transect. 10-hour fuels are defined as pieces which have a cross section diameter of between .25 and .99 inches inclusive at the point of intersection with the sampling plane. Accuracy Standard: $\pm 30\%$

Twig 3 (1.0 - 2.99) (3-digit)

Record the number of 100-hour fuels intersecting the first 14 feet of the Brown's transect. 100-hour fuels are defined as pieces with a cross section diameter of between 1.0 and 2.99 inches inclusive at the point of intersection with the sampling plane. Accuracy Standard: $\pm 20\%$

Inventory Methods

There are three approved methods used to inventory dead, down, woody debris. The Chippewa NF will use the Planar Intercept Method is detailed in “Handbook for Inventorying Down, Woody Material” by James K. Brown (1974). This method uses data measurements that are accurate to a specific statistical reliability.

Planar Intercept (Brown’s Protocol)

Sampling Procedures

For average amounts of downed material, about 5 to 6 minutes per sample point is required for the measurements. More time is usually spent in traveling and locating sample points than in making the measurements. If only downed woody material is inventoried, a two-person crew can complete 20 to 40 plots per day, depending on how much material is present.

The Sampling Planes

The inventory is based on the planar intersect technique which has the same theoretical basis as the line intersect technique. The planar intersect technique involves counting intersections of woody pieces with vertical sampling planes that resemble guillotines dropped through the downed material. Review the following literature for more information:

Brown, James K. 1974. Handbook for inventorying downed woody material. USDA For. Serv. Gen. Tech. Rep. INT-16, 24 p. Intermt. For. and Range Exp. Stn., Ogden, Utah.

Brown, James K., and Peter J. Roussopoulos. 1974. Eliminating biases in the planar intersect method for estimating volumes of small fuels. For. Sci. 20(4): 350-356.

Van Wagner, C. E. 1968. The line intersect method in forest fuel sampling. For. Sci. 14(1): 20-26.

Sampling Plane Height

The sampling plane height (vertical height) is undefined so that all intersections of dead down material are tallied regardless of their height above the ground. Tree boles (of dead trees) are considered down if they lean greater than 45 degrees from the perpendicular. Sampling plane lengths vary by size and amount of downed woody material.

Sampling Plane Length

Length of sampling plane can be varied by users to obtain desired sampling precision. Generally, as fewer sample points are taken, sampling plane lengths should be longer to achieve desired sampling precision.

Sampling plane lengths are horizontal lengths. Slope distance will need to be adjusted to a horizontal distance. If a sampling plane extends beyond the border of the stand, truncate the plane at the stand boundary.

The standard length of the sampling plane, on the Chippewa NF, will be 75 feet.

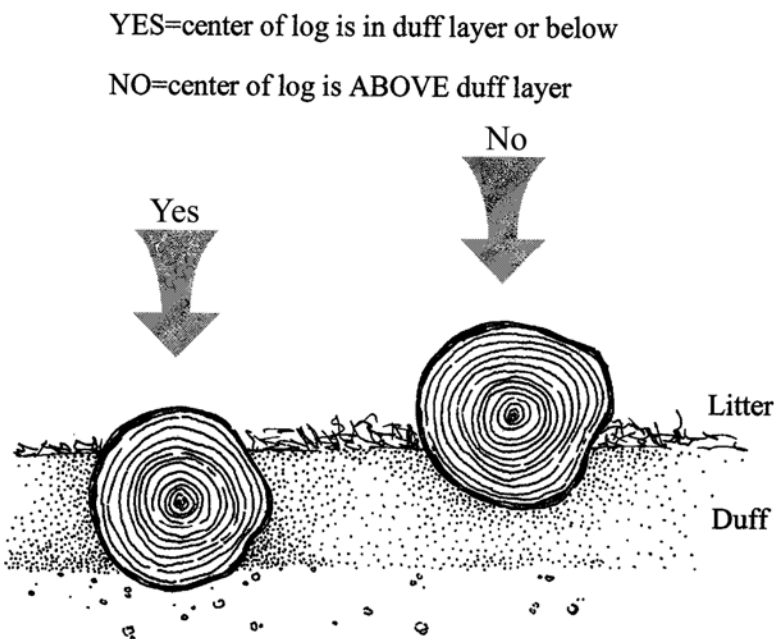
Tally Rules for the Downed Fuel Inventory

1. Particles qualifying for tally include downed, dead woody material (twigs, stems, branches, and bolewood) from trees and shrubs. Dead branches attached to boles of standing trees are omitted because they are not downed vegetation. Consider a particle “downed” if it has fallen to the ground, or is severed from its original source of growth. Cones, bark flakes, needles, leaves, grass, and forbs are not counted. Dead woody stems and branches still attached to standing brush and trees are not counted.
2. Twigs or branches lying in the litter layer and above are counted. However, they are not counted when the intersection between the central axis of the particle and the sampling plane lies in the duff (forest floor below the litter).

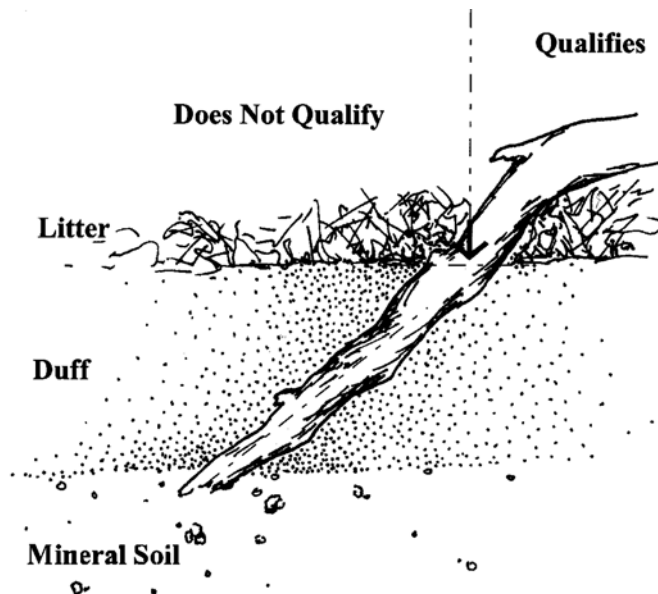
3. If the sampling plane intersects the end of a piece, tally only if the central axis is crossed. If the plane exactly intersects the central axis, tally every other such piece.
4. Don't tally any particle having a central axis that coincides perfectly with the sampling plane.
5. If the sampling plane intersects a curved piece more than once, tally each intersection.
6. Tally uprooted stumps and roots not encased in dirt. For tallying, consider uprooted stumps as tree boles or individual roots, depending on where the sampling planes intersect the stumps. Do not tally undisturbed stumps.
7. Tally all intersections of dead tree boles that lean greater than 45 degrees from the perpendicular regardless of the height of these intersections. Do not tally intersections of any standing dead trees that do not lean greater than 45 degrees from the perpendicular even if the point of intersection is within six feet of the ground.

Explanatory Figures

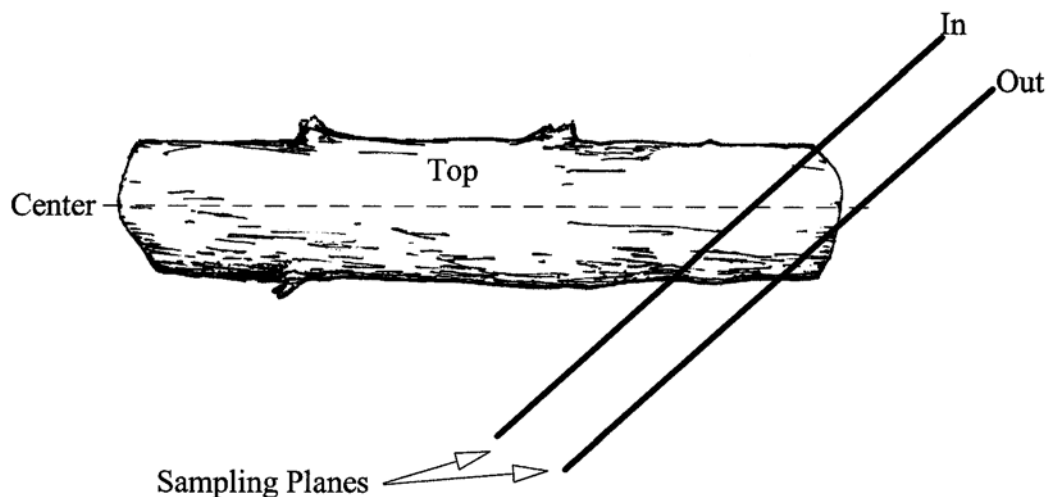
1. When stumps, logs, and trees occur at the point of duff measurement, offset one foot perpendicular to the right of the sampling plane. Measure through rotten logs whose central axis is in the duff layer.



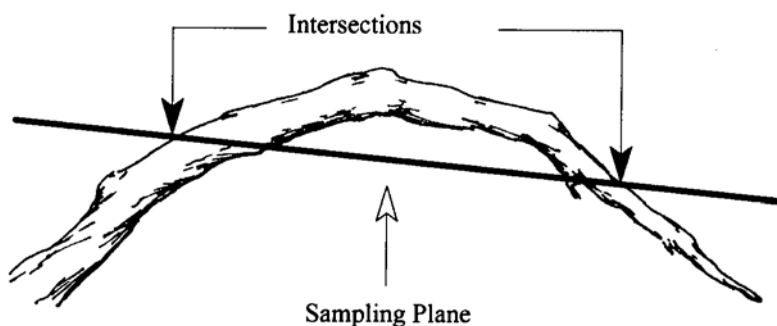
Twigs or branches lying in the litter layer and above are counted. They are not counted when the intersection between the central axis of the particle and the sampling plane lies in the duff (forest floor below the litter).



- a. If the sampling plane intersects the end of a piece, tally only if the central axis is crossed. If the plane exactly intersects the central axis, tally every other such piece.



- b. If the sampling plane intersects a curved piece more than once, tally each intersection.



Piece Count (3-digit)

Record the number of 1000-hour fuels (three inches + in diameter or as stated on the Sample Design form). Tally each decay class separately. If pieces are touching, it is considered one piece.

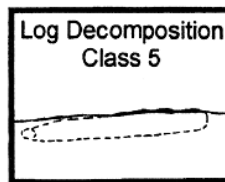
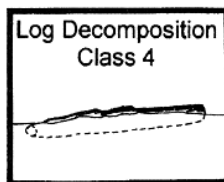
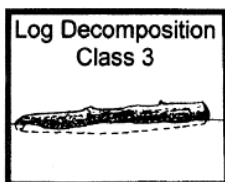
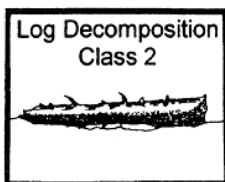
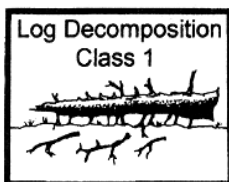
Accuracy Standard: No missed pieces.

Decay Class (1-character)

Record the decay class (1-5) for the pieces three inches in diameter and larger.

Log Decay Class

Code	Bark	Twigs	Texture	Shape	Wood Color	Portion of log on ground
1	Intact	Present	Intact	Round	Original	None, elevated on supporting points
2	Intact	Absent	Intact to soft	Round	Original	Parts touch, still elevated, sagging slightly
3	Trace	Absent	Hard large pieces	Round	Original to faded	Bole on ground
4	Absent	Absent	Soft blocky pieces	Round to oval	Light brown to faded brown	Partially below ground
5	Absent	Absent	Soft, powdery	Oval	Faded light yellow or gray	Mostly below ground



Diameter (3,1-digit)

Record the diameter of each intersected piece three inches in diameter and larger.

Accuracy Standard: ± 1 inch

Piece Length (3,1-digit)

Record the piece length, in feet, of each piece three inches in diameter or larger. Record the diameter of each intersected piece three inches in diameter and larger. Piece length is not required by Brown's protocol to compute tons and volume per acres. However, it is useful data for wildlife specialists.

Accuracy Standard: $\pm 20\%$